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A New Species of *Hisonotus* (Siluriformes, Loricariidae) of the Upper Río Uruguay Basin

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ABSTRACT

A new species of the hypoptopomatine genus *Hisonotus* (Loricariidae) is described from a small tributary of the upper río Uruguay basin near the border between Uruguay and Brazil. The new species can be distinguished from all other congeners by the following combination of characters: (1) presence of serrae along distal two thirds of posterior margin of pectoral-fin spine (versus serrae absent, posterior margin smooth); (2) odontodes along anterior margin of snout biserially arranged, dorsad and ventrad series separated by narrow odontode-free area covered by pad of soft tissue; (3) caudal peduncle short (27–34% SL, versus > 34% SL) and deep (13–15 % SL, versus < 13% SL); (4) eye large (15–19% HL, versus < 13% HL); and (5) caudal-fin pigmentation, when well defined, dark brown with a pair of whitish blotches on upper and lower lobes. The significance of the distribution of the new species is discussed relative to the degree of endemism of other fish groups in the Uruguay basin.

RESUMEN

Una nueva especie de Hypoptopomatinae del género *Hisonotus* (Loricariidae) es descripta para un pequeño tributario del río Uruguay superior, cerca del límite entre Uruguay y Brasil. La nueva especie puede distinguirse de todas las otras especies nominales del género por la siguiente combinación de caracteres: (1) presencia de sierra a lo largo del margen posterior de los dos tercios distales de la espina pectoral (versus margen posterior liso), (2) odontodes del margen anterior del hocico ordenados biserialmente, las series dorsal y ventral separadas por una banda angosta libre de odontodes, cubierta por tejido blando; (3) pedúnculo caudal

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corto (27–34 % LE, versus usualmente > 34) y alto (13–15 % LE, versus usualmente < 13); (4) ojo grande (15–19 % in HL, versus usualmente < 13), y (5) patrón de coloración de la aleta caudal, cuando se encuentra bien definido, marrón oscuro, con un par de manchas blanquecinas sobre los lóbulos superior e inferior de la aleta. La distribución geográfica de la nueva especie es discutida en relación al grado de endemismo registrado en otros grupos de peces de la cuenca del río Uruguay.

INTRODUCTION

As presently defined, the loricariid genus *Hisonotus* Eigenmann and Eigenmann, 1889 consists of 12 nominal species (Reis and Schaefer, 1998; Schaefer, 1997, 1998), mostly occurring in Atlantic coastal streams of southern Brazil and the Paraguay-Paraná system of southern South America. *Hisonotus* is a member of the loricariid subfamily Hypoptopomatinae, tribe Otothyrini (Reis and Schaefer, 1998; Schaefer, 1998), a monophyletic group diagnosed by the uniquely derived presence of a medially reflected ventral preopercle margin, forming a laminar shelf mesial to the canal-bearing cheek plate (Schaefer, 1998). The nomenclatural history of *Hisonotus* is intermingled with that of the genus *Microlepidogaster* Eigenmann and Eigenmann, 1889, which for most of the 20th century was considered a senior synonym of the former (e.g., Regan, 1904; Isbrücker, 1980). Under this classification, *Microlepidogaster* (including all nominal species of both *Microlepidogaster* and *Hisonotus*) had been distinguished from other hypoptopomatines by a combination of plesiomorphic character states, such as laterodorsal position of the eyes, arrector fossae open, presence of few pterotic fenestrae, and presence of an unplated region anterior to the nostrils (Britski, 1972; Buckup, 1981; Schaefer, 1991). Schaefer (1998) revalidated and diagnosed *Hisonotus* by the absence of plates anterior to the nostrils and the presence of robust rostral plates with enlarged odontodes, whereas *Microlepidogaster* was distinguished by the posterior position of the dorsal fin and by having the rostrum composed of thin plates lacking enlarged odontodes. Revision of both *Hisonotus* and *Microlepidogaster* are studies in progress by the second author.

The new species is placed in the genus *Hisonotus* on the basis of the diagnostic characters mentioned above, and is diagnosed among congeners by a unique combination of characters. Specimens were collected by Raúl Ringuelet in the upper río Uruguay basin, a region of southeastern South America with endemic species of several groups of fishes (Buckup, 1981; Britski and Garavello, 1984; Reis and Schaefer, 1998).

METHODS

Measurements were taken following Buckup (1981) using a digital caliper to the nearest 0.1 mm, reported as proportions of standard length (SL) except where noted. Suborbital depth is defined as the distance in lateral view between the lower margin of the bony orbit and ventrolateral limit of the head. Meristic characters were obtained for right and left sides of each specimen. Nomenclature of body plates follows Schaefer (1997). Values for counts and measurements of the holotype are given in brackets. Bilateral counts are presented as left/right when asymmetric. Vertebral counts include five centra incorporated into the Weberian complex (Schaefer, 1987). In the text, "pectoral-fin spine" and "pelvic-fin spine" refer to the first lepidotrich of the pectoral and pelvic fins, respectively, which in siluriforms, though unbranched, are not true spines but rather highly ossified spine like segmented rays.

Osteological observations were made on specimens cleared and counter-stained for bone and cartilage following Taylor and Van Dyke (1985). Illustrations were prepared using a Wild TYP stereomicroscope. In the list of material examined, cs denotes cleared and stained material.

Institutional abbreviations

AMNH	American Museum of Natural History, New York
ANSP	Academy of Natural Sciences of Philadelphia
FMNH	Field Museum of Natural History, Chicago

Fig. 1. *Hisonotus ringueleti,* holotype, ILPLA 886, female, 35.8 mm SL.

ILPLA	Instituto de Limnología "Dr. Raúl A. Ringuelet", Buenos Aires
MCP	Museo de Ciências e Tecnologia, PUCRS, Porto Alegre, Brazil
MLP	Museo de La Plata, La Plata, Argentina
MZUSP	Museu de Zoologia, Universidade de São Paulo, Brazil
UMMZ	University of Michigan, Museum of Zoology, Ann Arbor
USNM	National Museum of Natural History, Smithsonian Institution, Washington, DC

SYSTEMATIC ACCOUNT

Hisonotus ringueleti, new species

Figure 1

DIAGNOSIS: No autapomorphy was found for *Hisonotus ringueleti.* The new species can be distinguished from all other species of *Hisonotus* by the combination: (1) presence of serrae along distal two-thirds of posterior margin of pectoral spine (versus serrae absent, posterior margin smooth) (fig. 2B); (2) odontodes along anterior margin of snout biserially arranged, dorsad and ventrad series separated by narrow odontode-free area (fig. 3, top); (3) caudal peduncle short (27–34% SL, versus > 31% SL) and deep (13–15 % SL, versus < 13% SL); (4) eye large (15–19% HL, versus < 13% HL); and (5) caudal-fin pigmentation, when well defined, dark brown with pair of whitish blotches on upper and lower lobes (fig. 4, top).

REMARKS: Among nominal species of *Hisonotus,* the presence of serrae along the posterior margin of the pectoral spine was also observed in *Hisonotus taimensis* Buckup, 1981, and *H. nigricauda* (Boulenger, 1891), which precludes this feature as autapomorphic for *H. ringueleti* among species of *Hisonotus.* However, the consistency of certain intrinsic features of the serrae in *H. ringueleti* are noteworthy. Specifically, serrae of *H. ringueleti* (1) are consistently present in individuals, versus variably present among individuals in other species, (2) are composed of robust "teeth" (tooth height approximately 40–50% of spine width at tip), versus teeth feeble and inconspicuous (tooth height < 20% of spine width at tip), and (3) occupy the distal two-thirds of the pectoral-fin spine shaft, versus restricted to distal quarter of spine shaft in other species of *Hisonotus.*

TABLE 1
Morphometric and Meristic Data for *Hisonotus ringueleti*

		Males (N = 10)				Females (N = 10)			
	Holotype	Min	Max	Mean	SD	Min	Max	Mean	SD
Standard length	35.8	26.8	30.1	28.4	1.12	27.5	35.5	31.93	2.56
PERCENT OF STANDARD LENGTH									
Predorsal length	45.5	46.4	48.0	46.9	0.47	46.8	49.5	47.63	0.94
Head length	33.8	34.9	37.5	36.2	0.89	35.2	39.2	36.80	1.15
Cleithral width	23.3	22.1	23.8	23.0	0.64	21.8	25.4	23.47	1.09
Dorsal-fin spine length	25.9	26.0	31.2	27.9	1.75	25.4	29.0	27.30	1.09
Trunk length	16.2	15.2	19.0	17.0	1.07	15.1	18.6	16.61	1.10
Pectoral-fin spine length	25.6	23.9	27.9	26.3	1.41	25.9	28.2	27.09	0.70
Pelvic-fin spine length	14.6	19.6	23.7	21.2	1.41	14.9	19.1	17.56	1.36
Abdominal length	17.2	17.5	21.4	19.6	1.19	17.4	20.1	19.02	0.83
Caudal peduncle length	31.2	28.8	32.0	30.9	1.08	27.3	33.8	30.63	1.71
Caudal peduncle depth	14.1	13.0	14.9	13.7	0.58	13.0	14.9	13.65	0.56
Head depth	17.6	18.0	19.4	8.4	0.39	17.7	19.6	18.67	0.65
Snout length	10.5	9.3	11.5	10.5	0.60	10.5	11.7	11.08	0.44
Horizontal eye diameter	5.6	5.7	6.6	6.2	0.29	5.6	6.8	6.08	0.33
Least interorbital diameter	13.9	13.5	16.4	15.0	0.99	14.2	17.0	15.19	0.83
PERCENT OF HEAD LENGTH									
Head depth	52.1	49.5	53.4	50.9	1.61	48.1	53.0	50.76	1.89
Snout length	31.1	26.7	30.7	28.9	1.29	28.7	32.8	30.12	1.32
Horizontal eye diameter	16.7	15.8	18.8	17.1	0.97	15.3	17.5	16.52	0.73
Least interorbital diameter	41.0	38.2	44.9	41.5	2.41	38.7	44.4	41.28	1.71
COUNTS									
Left lateral plates	24	23	25	24.1	0.57	24	24	24.0	0
Right lateral plates	23	24	25	24.1	0.32	23	25	24.0	0.67
Predorsal plates	3	3	3	3.0	0	3	3	3.0	0
Left premaxillary teeth	13	11	14	12.4	0.84	12	16	13.3	1.25
Right premaxillary teeth	12	11	15	12.3	1.49	12	16	13.8	1.14
Left dentary teeth	11	9	12	11.2	1.14	10	14	12.2	1.40
Right dentary teeth[a]	14	9	13	11.0	1.33	11	15	12.6	1.24
Dorsal-fin branched rays	6	6	7	6.4	0.52	6	7	6.4	0.52
Pectoral-fin branched rays	5	5	5	5.0	0	5	5	5.0	0
Pelvic-fin branched rays	5	5	5	5.0	0	5	5	5.0	0
Anal-fin branched rays	4	4	4	4.0	0	4	4	4.0	0
Caudal-fin branched rays	14	14	14	14.0	0	14	14	14.0	0

[a] N = 9 for females.

DESCRIPTION: Descriptive morphometric and meristic data are provided in table 1. Adult body size moderate (N = 126; mean 28.3 mm SL, range 26–39). Body relatively stocky, greatest body depth at supraoccipital, 17.7–19.6 [17.6]% SL, slightly deeper than depth at dorsal-fin origin; caudal peduncle deep, 13.0–14.9 [14.1]% SL. Head moderately narrow, cleithral width 21.8–25.4 [23.3]% SL. Dorsal profile of head from snout tip to supraoccipital convex, anterior to nostrils slightly depressed, between eyes slightly convex. Cross-sectional profile of supraoccipital gently convex. Snout tip rounded in dorsal view. Eyes placed dorsolaterally, horizontal eye diameter 5.6–6.8 [5.6]% SL, larger than suborbital depth. Iris diverticulum present, large, its length two-thirds of pupil diameter.

Lips papillose, posterior margin fimbriate. Maxillary barbels short. Jaw teeth bifid, major cusp slender, blade tip rounded; minor cusp minute, pointed. Relatively few jaw teeth, 11–16 (mode, 12) on premaxilla, 9–14

(mode, 12) on dentary; accessory teeth (sensu Reis and Schaefer, 1992) absent.

Body covered by dermal plates except for area around anus, skin covering lateral opening of swimbladder capsule, base of paired fins, area between pectoral girdle and lower lip, and snout anterior to nostrils. Lateral and anterior rostral plates reflected ventrally. Trunk plates arranged in five lateral series (fig. 2A): (1) dorsal series continuous; (2) mid-dorsal series discontinuous; (3) median series 23–24, incomplete, discontinuous, composed by anterior sector of 1–3 plates and posterior sector of 16–18 plates, separated by gap; (4) mid-ventral series incomplete, continuous; and (5) ventral series incomplete, continuous. Lateral-line canal incomplete, discontinuous, with anterior field of 1–4 [4] canal-bearing plates along anterior sector of median series, and posterior field of 1–3 [3] plates along posterior sector of median series. Abdomen partly covered by plates variable in size and shape, arranged in paired lateral series of 3–6 [6/4] plates each, and a median series of 3–6 [6] plates. Anal fin preceded by 4 paired lateral plates, variably contacting antimeres at midline. Coracoids and cleithra exposed ventrally, except for area at midline and surrounding arrector fossae.

Odontodes covering head, trunk, and fin rays. Head and trunk odontodes uniformly distributed, not arranged in distinct longitudinal lines or forming keels. Odontodes generally small, except for enlarged odontodes on ventral aspect of pelvic and pectoral spines, anterior rostral margin of snout, and tuft at posterior supraoccipital tip, not elevated above level of plate posterior to supraoccipital. Odontodes along anterior margin of snout biserially arranged, dorsad and ventrad series separated by narrow odontode-free area covered by pad of soft tissue; ventrad series composed of a continuous row of enlarged and laterally faceted odontodes and paired lateral patch of smaller, conical odontodes (fig. 3).

Dorsal-fin origin slightly posterior to vertical through pelvic-fin origin. Adipose fin absent. Pectoral fin, when depressed, overlapping nearly two-thirds of pelvic-fin length; serrae along distal two-thirds of posterior margin of pectoral-fin spine, robust (tooth height approximately 40–50% of spine width at tip) (fig. 2B). Pelvic fin, when depressed, reaching beyond anal-fin origin only in males (see SEXUAL DIMORPHISM, below).

OSTEOLOGY: The following is not an exhaustive description, but an account of character states present in the new species for features that have been treated in recent phylogenetic analyses (Schaefer, 1991, 1998). Mesethmoid tip bearing small, uncinate process directed ventrally; mesethmoid disk separated from mesethmoid tip by one-quarter disk width. Parasphenoid shaft, posterior to lateral processes, laterally constricted. Pterotic bone fenestrae relatively few in number, expanded and rounded, restricted to anteroventral part of compound pterotic. Swimbladder-capsule lateral opening wide.

Upper pharyngeal tooth- plate dentition with narrow extension anteriorly. Total vertebrae 27. Vertebral centra 10–15 with bifid neural spines, 15–18 with bifid hemal spines; distal portions of neural and hemal spines tapering distally, widely separated from one another. Seventh vertebral centrum not expanded anterior to dorsal-fin first proximal radial; anterior margin of seventh vertebral centrum simple.

Posterior margin of caudal-fin skeleton straight or with slight median notch. Dorsal-fin spinelet small, roughly triangular; dorsal-fin locking mechanism absent. Dorsal-fin first three proximal radials with transverse process expanded.

COLOR IN ALCOHOL: Ground color of dorsolateral surfaces of head and body light brown, lighter on rostral margin of snout, ventrolateral edge of cheek, area anterior to nostrils, and opercular region. Nostril flap dark brown. Dorsum of body with brown pigmentation, having irregular patchy pattern. Trunk with irregular blotches. Ventral surface of head and trunk whitish, with clumped melanophores on abdomen, area surrounding anus, and lips. Pad of soft tissue between dorsad and ventrad series variably pigmented. Pectoral-fin spine with six dark blotches. Branched rays of pectoral, dorsal, and anal fins mostly unpigmented. Caudal-fin pigmentation of unbranched rays with series of dark blotches variable in number. Pigmentation of caudal-fin branched rays vari-

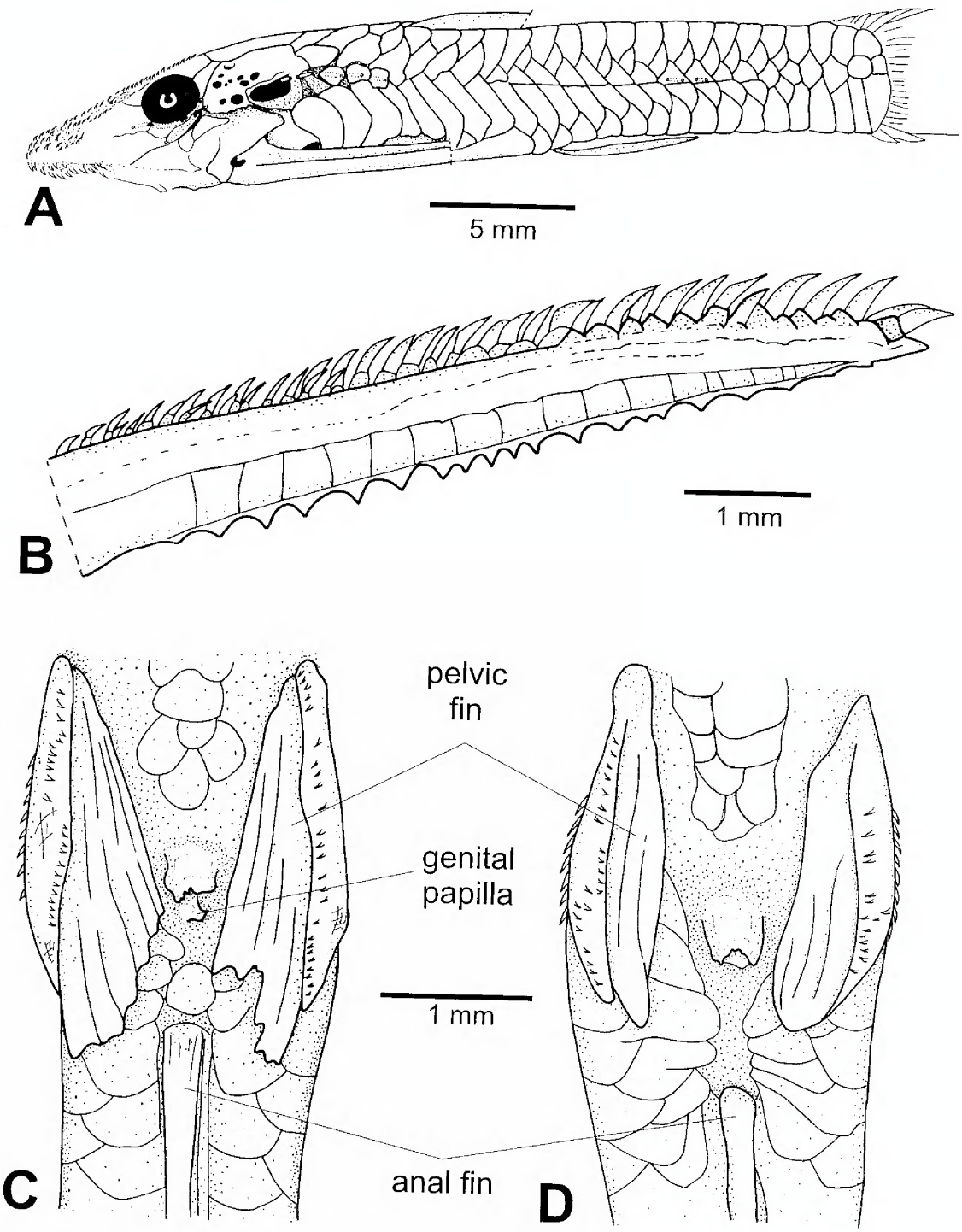

Fig. 2. *Hisonotus ringueleti,* ILPLA 883. **A,** Body lateral view, pattern of trunk lateral plates; **B,** pectoral-fin spine; dorsal view, anterior toward top; **C, D,** anal region in males and females, respectively, showing sexual dimorphism in pelvic-fin length; anterior toward top.

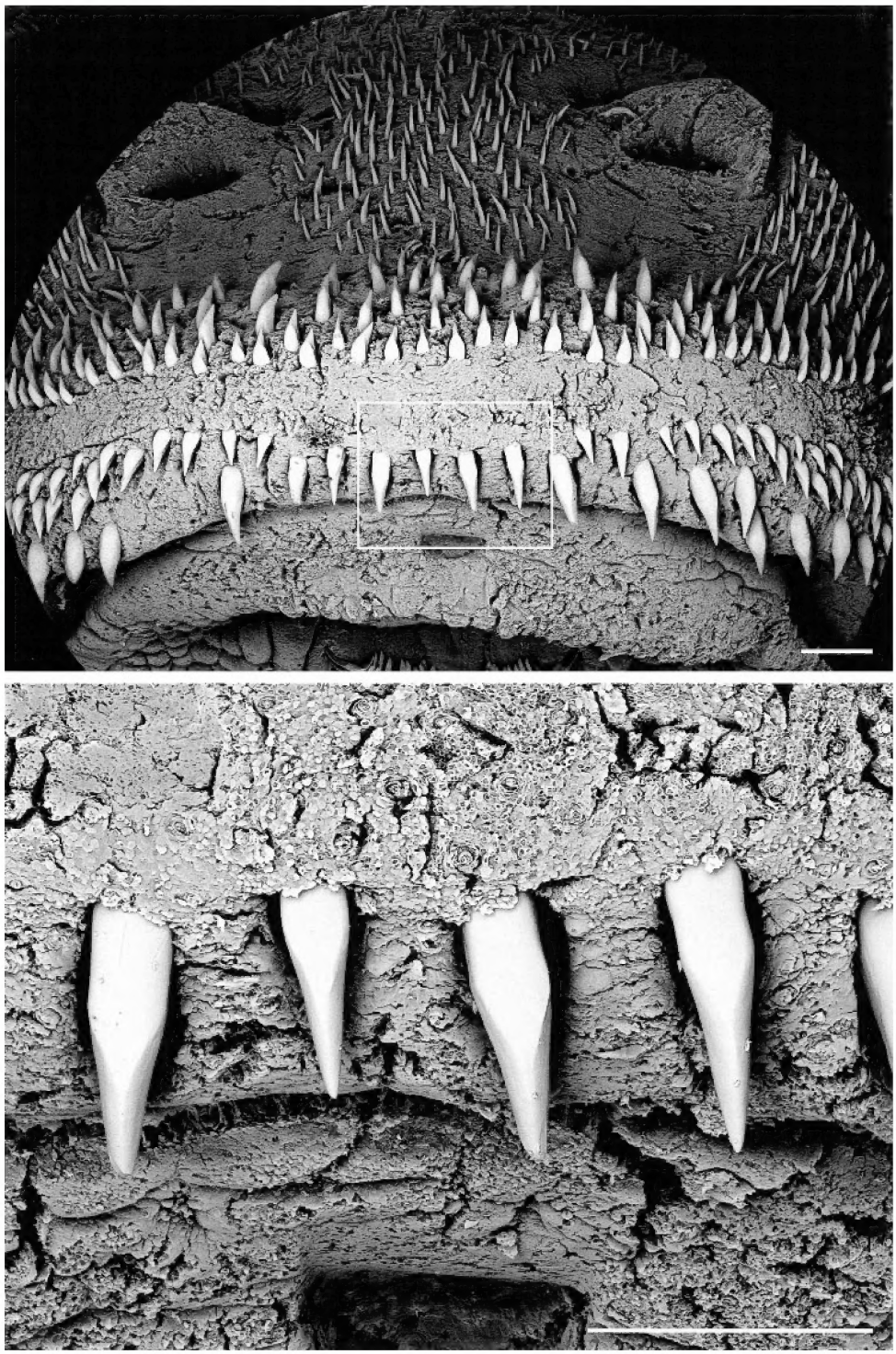

Fig. 3. Scanning electron micrograph of snout anterior rostral margin of *Hisonotus ringueleti* (AMNH 230702, female, 33.2 mm SL), scale bars 0.5 mm. **Top,** anterior view showing biserial arrangement of odontodes, 20×; **bottom,** magnification showing faceted odontodes of the ventrad series, 80×.

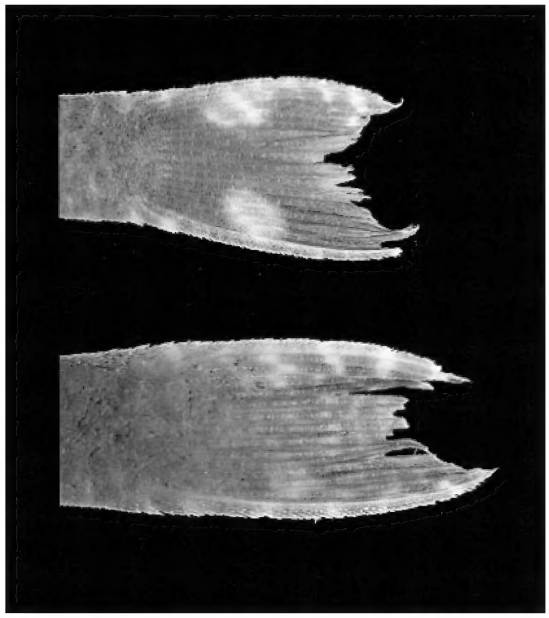

Fig. 4. *Hisonotus ringueleti,* ILPLA 883, caudal-fin pigmentation. **Top,** 27.4 mm SL, **bottom,** 31.5 mm SL.

able, ranging from a well-defined pattern of ground color dark brown and a pair of lighter blotches of moderate size placed symmetrically relative to longitudinal axis (fig. 4, top), to a pattern of ground color dark brown, with a series of small light blotches on dorsal and ventral lobes variably connected between lobes forming light transverse bars (fig. 4, bottom).

DISTRIBUTION: Known only from the type locality, a creek in the río Quaraí, a tributary of the upper río Uruguay.

HABITAT: This species was collected from a small creek, ca. 0.5 m depth, with rapid current and clear water, bottom composed of rocks and sand, and with vegetated margins. Specimens of the new species were collected from around submerged rocks and aquatic plants (C. Roldán, personal commun.).

SEXUAL DIMORPHISM: Males smaller than females, mean standard length 26.9 (N = 58) versus 29.3 (N = 66). Genital papilla of males pointed; fleshy flap along posterior margin of pelvic-fin spine of males. Males with longer pelvic fins (longest pelvic-fin ray length 19.6–23.7% SL, versus 14.9–19.1% SL); distance from anus to anal-fin origin shorter (16.3–18.6%, versus 19.8–22.8% SL; fig. 2C, D). Pelvic fin not reaching anal fin origin in 85% of females (versus 7% of males); reaching first anal-fin ray in 15% of females (versus 35% of males); reaching beyond first anal-fin rays in no females (versus 58% of males).

ETYMOLOGY: Named after Dr. Raúl A. Ringuelet (1914–1982), researcher and professor of the Museum of Natural Sciences of La Plata, Buenos Aires. Dr. Ringuelet's vast career includes the publication of the book *Los Peces de Agua Dulce de la República Argentina* (Ringuelet et al., 1967), which set the standard for systematics research conducted during the last decades of the 20th century in the Austral region of the Neotropics.

MATERIAL EXAMINED: *Holotype:* ILPLA 886 (35.8 mm, female), Uruguay, Rivera State, upper Uruguay River basin, Quaraí River drainage, creek at Km 18 of route joining Santana do Livramento, Brazil, and Rivera, Uruguay; close to border (ca. 31° 00′ S, 55° 30′W). Coll. R. A. Ringuelet and C. Roldán, 24 July 1981.

Paratypes: collected with holotype. ILPLA 883 (51 ♀ + 44 ♂, 26.0–39.2 mm SL). AMNH 230702 (3 ♀ + 2 ♂ + 3 cs, 23.3–33.2 mm SL); ANSP 177878 (1 ♀ + 2 ♂ + 1 cs, 22.9–32.4 mm SL); FMNH 108806 (2 ♀ + 2 ♂, 25.7–32.2 mm SL); MCP 26154 (2 ♀ + 1 ♂ + 1 cs, 26.4–31.3 mm SL); MLP 9536 (2 ♀ + 2 ♂, 27.9–33.4 mm SL); MZUSP 62788 (1 ♀ + 2 ♂, 23.3–31.1 mm SL); USNM 362665 (2 ♀ + 2 ♂, 27.2–32.0 mm SL).

COMPARATIVE MATERIAL: *Hisonotus* sp.: FMNH 59635; USNM 206204, 297971, 235073, 300968, 235072, 345698, 345937. *Hisonotus laevior*: USNM 235075, 285894, 326112. *Hisonotus leucofrenatus*: FMNH 59628. *Hisonotus maculipinnis*: UMMZ 206297; USNM 176024. *Hisonotus nigricauda*: USNM 181550, 177537 (2 cs). *Hisonotus notatus*: FMNH 59636. *Hisonotus paulinus*: FMNH 59636. *Hisonotus punctatus*: MHNG 240825 (1 cs); UMMZ 206204 (1 cs). *Hisonotus taimensis*: ANSP 168949 (1 cs); USNM 235062. *Microlepidogaster perforatus*: ANSP 174718 (1 cs).

DISCUSSION

The most distinctive feature of *Hisonotus ringueleti* is the presence of serrae on the

posterior margin of the pectoral-fin spine, a character which had been previously reported also for three of six genera within the tribe Hypoptopomatini, subfamily Hypoptopomatinae (*Acestridium* Haseman, 1911, *Hypoptopoma* Günther, 1868, and *Oxyropsis* Eigenmann and Eigenmann, 1889) (Schaefer, 1991). As far as we know, species of *Hisonotus* are the only representatives of the tribe Otothyrini having such pectoral-fin spine serrae. A more exhaustive examination of this feature revealed that the presence of serrae is more widespread among species of *Hisonotus* and not exclusive to *H. ringueleti,* although *Hisonotus* remains the only genus of Otothyrini with species having serrated pectoral spines. We observed this condition as variably present in *H. taimensis* and bilaterally variable in one specimen of *H. nigricauda.* The condition observed in *H. ringueleti* differs from that of both *H. taimensis* and *H. nigricauda* in three respects. First, the presence of serrae appears to be fixed in *H. ringueleti,* as it is observed consistently among individuals, versus variably present among and within individuals of other *Hisonotus* species. Secondly, the serrated margin is composed of robust tooth like structures in *H. ringueleti,* versus feeble and inconspicuous serrae in the other species. Finally, in *H. ringueleti* the serrae are more numerous and occupy the distal two-thirds of the pectoral-fin spine, versus fewer in number and restricted to the distal quarter of the spine.

The particular odontode arrangement on the anterior margin of the snout of *H. ringueleti,* composed of dorsad and ventrad series of odontodes separated by an odontode-free narrow gap, has not been previously reported for any other nominal species of *Hisonotus.* Some species of the genus have a similar arrangement of dorsally and ventrally directed odontode series on the rostral margin (e.g., *H. nigricauda*), though without an associated odontode-free gap. Among other Otothyrini, the presence of a similar discontinuity in the odontode distribution on the snout was reported for species of *Pseudotocinclus* Nichols, 1919 (Schaefer, 1991) and *Otothyris* Myers, 1927 (Garavello et al., 1998). According to the phylogenetic scheme proposed by Schaefer (1998), the genera *Pseudotocinclus* and *Otothyris* are both relatively well nested within the Otothyrini and separated from the more basal position of *Hisonotus.* Therefore, it is most parsimonious to conclude that the presence of an odontode-free narrow gap between dorsad and ventrad series was independently derived in the aforementioned genera.

The presence of a pad of soft tissue on the snout tip has also been observed in *H. laevior* Cope, 1884, *H. nigricauda,* and *H. taimensis.* However, the new species can be distinguished from those three by having the pad associated with an actual odontode-free area. The relatively deep caudal peduncle (greater than 13% SL) further distinguishes *H. ringueleti* from other nominal species of *Hisonotus.*

Relative to other nominal species of *Hisonotus,* the new species can be distinguished from *H. depressicauda* (Ribeiro, 1918) by the absence of odontodes arranged as distinct keels on the head; from *H. depressinotus* (Ribeiro, 1918) by the robust head and trunk (versus anterior region markedly depressed), from *H. laevior, H. maculipinnis* (Regan, 1912), and *H. nigricauda* by the presence of large dorsal and ventral light spots on the caudal fin (versus bar-pattern pigmentation), from *H. taimensis* by having fewer plates along the median lateral series (ca. 24, versus ca. 30), from *H. leucofrenatus* (Ribeiro, 1908) by having a shorter caudal peduncle (27.3–33.8% SL, versus ca. 40.5% SL) and abdominal plates comprising paired lateral series separated by a variably developed median series (versus abdominal and preanal region covered by few large irregularly arranged plates), from *H. notatus* (Eigenmann and Eigenmann, 1889) by having fewer jaw teeth (premaxilla teeth 11–16, versus 24; dentary teeth 9–13, versus 19).

The geographic distribution of this species, being restricted to the upper río Uruguay, is congruent with an emerging pattern of enhanced species richness and endemism of fishes in the upper Uruguay and Jacui river drainages, a phenomenon noted by other authors (e.g., Reis and Schaefer, 1998; Wimberger et al., 1998). This region is one of the best sampled of the Neotropics. Nevertheless, the rate of discovery of new endemic species for the region is still high (e.g. *Eurycheilichthys* Reis and Schaefer, 1998, *Gym-*

nogeophagus Wimberger et al., 1998; *Rineloricaria* Reis, 2000, unpubl., personal commun.) which is perhaps a direct result of increased sampling effort in headwater portions of the río Uruguay and its tributaries (Reis, 2000 unpubl., personal commun.).

A series of phylogeny-based biogeographical analyses of species of del Plata basin (Curimatidae—Vari, 1988; Loricariidae—Schaefer, 1997; Cichlidae—Wimberger et al., 1998; Callichthyidae—Reis, 1998) provides support in favor of a hypothesis of early Tertiary hydrogeological isolation that prevented dispersal between upper and lower reaches of the Uruguay basin. Wimberger et al. (1998) provided evidence supporting such a hypothesis on the basis of a well supported clade of *Gymnogeophagus* species of the upper Uruguay, relative to its sister clade in the lower Uruguay and Paraná rivers. Known distributions of several other fish taxa (cichlids—Reis and Malabarba, 1988; catfishes—Buckup, 1981; Britski and Garavello, 1984; Reis and Schaefer, 1998) provide further evidence in favor of a hypothesis of isolation.

As far as we can determine from available material, the distribution of *Hisonotus ringueleti* is restricted to a single, small tributary of the río Quaraí, within the upper Uruguay basin. Though it would be premature now to comment further on the significance of the distribution of *H. ringueleti* within the context of the biogeography of the genus as a whole, a number of emerging shared biogeographic patterns involve monophyletic clades within the loricariid subfamily Hypoptopomatinae. Seven of nine genera described for the clade Otothyrini (Reis and Schaefer, 1998) have a distribution restricted to southeastern Brazil (*Epactionotus, Eurycheilichthys, Microlepidogaster, Otothyris, Pseudotocinclus, Pseudotothyris, Schizolecis*). The two exceptions are *Hisonotus* (sensu Schaefer, 1998) and *Parotocinclus* (sensu Schaefer, 1991), both of which are more widely distributed in cis-Andean drainages of South America. Species of *Hisonotus* also occur in the lower Paraná, Paraguay, and lower Uruguay River drainages, and *Parotocinclus* species also occur in the Essequibo River of Surinam, in the middle Amazon basin, in the Atlantic coastal rivers of northeastern Brazil, and in the Orinoco River (Schaefer and Provenzano, 1993). In the most recent phylogenetic hypotheses, both *Hisonotus* and *Parotocinclus* are relatively basal taxa within the Otothyrini clade (Reis and Schaefer, 1998; Schaefer, 1998). In biogeographical terms, this suggests the possibility of an ancient continent-wide distribution of basal Otothyrini lineages, followed by subsequent isolation and speciation in more geographically restricted hydrogeographic regions of South America, a hypothesis that is congruent with the above-mentioned interpretation of Wimberger et al. (1998).

Among the Hypoptopomatini, *Otocinclus* and *Hypoptopoma* have the broadest distributions (Schaefer, 1991, 1997), with species present in the Paraguay, lower Paraná, São Francisco, northeastern Brazil, and Amazon and Orinoco river basins (Schaefer, 1991, 1997). Considering the relatively extensive collecting effort in these regions, the absence of both genera from the upper Uruguay is not likely the result of sampling bias.

Based on a phylogenetic analysis of *Otocinclus* Cope, 1872, Schaefer (1997) presented a hypothesis of area relationships involving many of the same areas of endemism shared by other hypoptopomine genera, such as *Hisonotus* and *Hypoptopoma*. Further evaluation of congruence among biogeographical patterns involving genera and supraspecific clades of Hypoptopomatinae must await the results of ongoing revisionary and phylogenetic analyses.

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